additional reasons for caution and regulatory forbearance. The best approach to pricing access for ISPs is regulatory decontrol, applying a market-based solution that allows the pricing of access service to be market-determined.

IV. The Revenues from Second Lines, and from ISP Rental of Lines, Do Not Compensate the Incumbent LEC for Congestion of the PSTN from Internet Usage

133. ISPs argue that the incumbent LEC's revenues from the end user's addition of a second line are sufficient to compensate the LEC for the costs arising from the untimed usage of its network by customers of ISPs. That conjecture is not credible for several reasons.

134. First, if the customer used the second line exclusively for local access to his ISP, that line would generate no revenues for the LEC from the provision of local toll calls, interstate access for long-distance calls, or vertical features. Consequently, the incumbent LEC could not expect to earn net revenues from such services and use those net revenues to offset the losses incurred on the provision of unmetered local service used to secure access to the Internet.

135. Second, if, to the contrary, the second line were a viable source of net revenues with which the incumbent LEC could offset losses from subsidizing ISPs, competitive local exchange carriers would immediately seek to serve the relevant customers through resale or through the purchase of unbundled network elements. The same result would occur if the state commission were to "order that the second line to the home or business be deregulated as to price, and not be the recipient of any subsidy," as Chairman Hundt suggested in March 1997.[72] Given the preference of the FCC and many state commissions to set prices for resale and UNEs on the basis of TELRIC, however, CLECs would bid down any net revenues that might be available to the incumbent LEC from the provision of a second line.

136. Third, congestion of the PSTN is a common cost that would not be reflected in the

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72. Hundt, *Pizza and Bandwidth*, *supra* note 66.

TELRIC-based prices that CLECs would pay to the incumbent LEC for unbundled network elements and wholesales services. CLECs could impose on the incumbent LEC the entire cost of alleviating congestion on the rationale that that cost is not incremental to the LEC's sale of any given UNE or wholesale service.

137. Finally, economic efficiency requires usage-based pricing of Internet access through a two-part or multi-part tariff. A two-part tariff would have a capacity charge and a usage charge. The current tariff design for a second line, however, in effect sets the capacity charge at the fixed monthly rate and the usage charge at zero. Even if the second line's fixed monthly rate generated positive net revenues for the incumbent LEC, that pricing regime nonetheless would be inefficient in terms of inducing congestion of the PSTN because the customer's marginal price for Internet access would still be zero. It is not clear *ex ante* whether or not the cost to the incumbent LEC of alleviating congestion would exceed the cost of forgone interstate access revenues under the ESP exemption.

138. It is also argued that the incumbent LEC receives compensation from its sale of access lines to an ISP. There are two flaws with this argument, however. First, there is no assurance that the incumbent LEC's revenue from the installation charge and monthly fees from all of the business lines supplied to an ISP will cover the total economic cost that the ISP imposes on the PSTN. An ISP does not use its business lines to make outgoing calls, which usually are priced on a metered basis. Rather, the ISP only receives calls on those lines, and the ISP pays no charge for incoming calls, as would a business that provided its customers a toll-free 800 or 888 number. It is, after all, a critical element of the ISP's business strategy to minimize the cost of access charges for its customers by making available to them ubiquitous local, toll-free access numbers. That is why, for example, the sign-on sequence for America Online enables the customer to search for local access numbers anywhere in the United States, and even in many foreign countries.

139. The second flaw in this argument is that the ISP is free to purchase its access lines from

a CLEC. In that case, the incumbent LEC receives absolutely no revenues from the ISP, even though the ISP imposes a substantial cost on the incumbent LEC's network. To make matters worse for the incumbent LEC, CLECs are demanding that the incumbent LEC pay a local interconnection charge whenever one of its own subscribers calls an ISP access number that is supplied by a CLEC. Despite the inherently interstate nature of such traffic, CLECs are in effect demanding that the incumbent LEC pay its competitors for the privilege of having its network congested with Internet traffic.[73] In a subsequent notice of proposed rulemaking, the Commission should ask ISPs to identify how many of their local access lines are supplied by CLECs and how many are supplied by the incumbent LEC. Similarly, the Commission should ask CLECs to identify how many of their total access lines are supplied to ISPs and how many are supplied to other firms that qualify for the ESP exemption. Moreover, the Commission should ask CLECs supplying access lines to ISPs to identify how their interconnection agreements with incumbent LECs specify compensation for terminating access for ISP traffic.

V. THE CLEAR POLICY DIRECTION FROM THE 1996 ACT IS THAT ANY SUBSIDY SHOULD BE EXPLICIT

140. In the Telecommunications Act of 1996, Congress directed the states and the Commission to work together to enunciate "policies for the *preservation* and advancement of universal service."[74] In particular, Congress specified: "*Quality* services should be available at just, reasonable, and affordable rates."[75] Congress further directed that the Commission convene a Federal-State Joint Board to recommend changes to the FCC's existing methods of funding universal service.[76] In turn, the Joint Board recommended, on the basis of "overwhelming support in the record," that "single-party service, voice grade access to the public switched telephone network . . . be designated for universal service

73. The CLEC, on the other hand, would not expect the ISP to originate any calls over those lines that would terminate on the incumbent LEC's network. In this case, therefore, one would expect the CLEC not to propose bill-and-keep as the compensation scheme for local interconnection.

74. 47 U.S.C. § 254(a)(2) (emphasis added).

75. *Id.* § 254(b)(1) (emphasis added).

76. *Id.* § 254(a)(1); *see also* S. REP. NO. 230, 104th Cong., 2d Sess. 131 (1996).

support pursuant to section 254(c)(1)."[77]

141. The Commission's tentative conclusion in this proceeding to perpetuate the ESP exemption places the agency on a collision course with the Telecommunications Act and the recommended decision of the Joint Board. The Commission has a duty to preserve the quality of voice grade access to the PSTN. The congestion due to increased demand to gain access to the Internet over the PSTN is incompatible with the preservation of the quality of voice telephony.

142. In contrast to its recommended decision to subsidize voice grade local telephony, the Joint Board expressly recommended that Internet usage *not* be entitled to subsidization under the universal service provisions of the Telecommunications Act of 1996:

> We find that access to the Internet, to the extent that this implies non-toll access, is provided through voice-grade access to the public switched network. The Joint Board rejects the position of some commenters that the actual use of Internet services be supported. We find that the provision of Internet service does not meet the statutory definition of a "telecommunications service." In addition, we decline to support toll access to Internet providers. We predict, however, that increasing demand for Internet service will result in broader accessibility of Internet service providers. This should have the effect of reducing or eliminating the need for customers in rural areas to place toll calls to obtain Internet service.[78]

In other words, the Commission explicitly concluded in November 1996 that Internet access was not entitled to a subsidy under the specific program that Congress created in 1996 to finance telecommunications subsidies. It is inconsistent with that conclusion for the FCC to act one month later, in its tentative conclusion in this proceeding, as though it possesses some kind of implicit mandate to subsidize Internet usage.

143. The Commission's tentative decision to perpetuate the ESP exemption manifests institutional amnesia. As recently as November 1996 the Commission, through the Joint Board, stated that

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77. Federal-State Joint Board on Universal Service, Recommended Decision, CC Dkt. No. 96-45, FCC 96J-3, ¶ 46 (released Nov. 8, 1996) (*Joint Board Recommended Decision*).

78. *Id.*

> the Joint Board and Commission may consider such "additional principles" as are necessary and appropriate for the protection of the public interest, convenience and necessity and are consistent with the 1996 Act. In addition to the principles specified in section 254(b), the Joint Board recommends that the Commission also be guided by the principle of "competitive neutrality" in that universal service support mechanisms and rules should be applied in a competitively neutral manner.[79]

The Joint Board found that competitive neutrality was a principle that permeated the Telecommunications Act of 1996:

> We believe this recommendation is consistent with the concept of competitive neutral contribution embodied in section 254(b)(4) and the explicit requirement of equitable and nondiscriminatory contributions in section 254(d), where Congress clearly articulated that all providers of interstate telecommunications shall contribute on an "equitable and nondiscriminatory" basis to universal service support mechanisms. We also note that section 254(h)(2) requires the Commission to establish competitively neutral rules relating to access to advanced telecommunications and information services for schools, health care providers and libraries. Competitive neutrality is also embodied in section 254(e)'s requirement that universal service support be explicit, section 254(f)'s requirement that state universal service contributions be equitable and nondiscriminatory and section 214(e)'s requirement that any carrier can be an eligible telecommunications carrier provided that it meets certain statutory criteria.[80]

As we showed in parts II and III, the ESP exemption is the antithesis of competitive neutrality. The exemption is a hidden subsidy ordered by regulators. It imposes an immediate cost on the incumbent LEC in terms of forgone access revenue and a subsequent cost in terms of network congestion that necessitates new investment in capacity to maintain the quality of voice grade service that regulators require. Those costs are either passed along to all users of the PSTN or borne by the LEC's shareholders. Meanwhile, the FCC also fails to treat ISPs with competitive neutrality. The Commission coddles them. The agency permits an ISP to export to telephony consumers and LEC shareholders one of its principal costs of doing business.

144. It is also clear that the Commission's tentative conclusion to perpetuate the ESP exemption violates the agency's earlier commitment, expressed in the recommended decision of the Joint Board, to refrain from picking technologies:

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79. *Id.* ¶ 3 (citing 47 U.S.C. § 254(b)(7)); *see also id.* at ¶ 23.
80. *Id.* at ¶ 23.

> We also believe that the principle of competitive neutrality encompasses the concept of technological neutrality by allowing the marketplace to direct the development and growth of technology and avoiding endorsement of potentially obsolete services. In recognizing the concept of technological neutrality, we are not guaranteeing the success of any technology for all purposes supported through universal service support mechanisms but merely stating that universal service support should not be biased toward any particular technologies.[81]

That goal is commendable. But the Commission treats it as empty rhetoric in this proceeding. Instead, the *Notice of Inquiry* manifests a preoccupation with technological fixes that would supposedly expand network capacity for Internet access over the PSTN—all while ignoring any consideration of the necessity of using the price system to ration, at *any* level of capacity, the demand for Internet access over the PSTN.

145. One possible rationalization for the Commission's equivocation on competitive neutrality would be to say that ISPs do not provide "telecommunications services" within the meaning of the Telecommunications Act of 1996 and that consequently they are not competitors of incumbent LECs; as a result, the lack of neutrality in the LECs' forced subsidy to ISPs does not engender a *competitive* imbalance between the two sets of firms. That reasoning is, of course, false. Regardless of whether an ISP is deemed for purposes of section 254 to supply "telecommunications services," it is clear that an ISP *already* supplies services that directly compete with some of those that the incumbent LEC currently supplies.

146. In an era of callback and access arbitrage, it is disingenuous and economically specious for the Commission to say that ISPs are merely using the LEC network to receive local calls from customers.[82] Internet users make those so-called "local" calls to ISPs specifically for the purpose of initiating a link to an interstate (indeed, international) network capable of providing substitutes for services that currently generate interstate access revenues for the incumbent LEC. Use of the Internet for e-mail and file transfers is already a highly cost-effective substitute for faxes. The untimed usage of the

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81. *Id.*
82. *Notice* ¶ 288.

PSTN to gain access to the Internet therefore already denies the LEC access charges that, after adjusting for price effects, the LEC otherwise would earn through interstate access charges.[83] The ISP and the incumbent LEC clearly compete in that respect, and the effect of the FCC's perpetuation of the ESP exemption would be to deny any possibility of "neutrality" between those two competitors.

147. The imminent use of the Internet for long-distance telephony will exacerbate the situation. Internet telephony is rapidly evolving from prototype to commercial application. In March 1997, for example, Motorola announced that it would license and sell VocalTec software that links corporate telephony networks to the Internet for purposes of making long-distance calls.[84] Similarly, Bill Gates, chairman of Microsoft, observed in 1996:

> [T]he Internet threatens to take away much of the lucrative long-distance business that supports the telephone companies today. It's becoming more common for people to use the Internet for long-distance calls to other Internet users anywhere in the world—despite the poor quality of voice transmission. But as quality of service guarantees are incorporated into the Internet platform, the fidelity of both audio and video two-way calling will become quite impressive.[85]

If Gates is correct about Internet telephony, the Commission's perpetuation of the ESP exemption could have profound effects on congestion of the PSTN and the financial ability of incumbent LECs and interexchange carriers to continue to invest in capacity expansion. First, the incumbent LEC would lose interstate access charges on long-distance calls that migrate to the Internet. Second, the substantially lower price of making long-distance calls over the Internet would cause demand for such calls to rise above current levels, for it is well known that the demand for long-distance calls is substantially more price elastic than the demand for local access.[86] Third, long-distance calls made over the Internet would be

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83. The same reasoning applies to intrastate access.

84. William M. Bulkeley, *Motorola to Sell VocalTec Software for Calls via Internet*, WALL ST. J., Mar. 3, 1997, at B6.

85. BILL GATES WITH NATHAN MYHRVOLD & PETER RINEARSON, THE ROAD AHEAD 120 (Penguin Books rev. ed. 1996). Gates does not address congestion of the PSTN caused by users substituting Internet telephony for conventional long-distance calls. But he does note that, if Internet telephony were to cause congestion *on the Internet*, possible solutions would be "to make everybody pay a higher flat rate" or "to find something to meter—whether time on the system, the distance over which bits are transmitted, the number of bits, or whatever." *Id.* at 121.

86. *See, e.g.*, LESTER D. TAYLOR, TELECOMMUNICATIONS DEMAND IN THEORY AND PRACTICE 294, 298 (Kluwer Academic Publishers 1994); ROBERT W. CRANDALL & LEONARD WAVERMAN, TALK IS CHEAP: THE PROMISE OF REGULATORY REFORM IN NORTH AMERICAN TELECOMMUNICATIONS 92 (Brookings Institution 1996).

initiated by the user's call to the ISP's local number, which would put additional strain on those trunks and switches of the incumbent LEC that are already taxed by current Internet access traffic. Fourth, as noted earlier, ISPs could be expected to purchase local access lines from CLECs, which are already arguing that, under current interconnection agreements, they are entitled to receive payments from the incumbent LEC for terminating access whenever one of the ISP's customers served by the incumbent LEC calls the ISP's access number. The confluence of those factors would increase the likelihood that, by its own policies, the Commission would produce the unintended consequence of degrading the quality of voice grade telephony.

CONCLUSION

148. The Commission stated in the *Notice of Inquiry*: "Ultimately, a full and open debate about the relationship of information services to the public switched network will benefit all parties."[87] That debate, however, must begin by asking why the Commission has forsaken the price system. One cannot expect incumbent LECs to receive correct signals for investment to alleviate the congestion in the PSTN resulting from Internet usage unless ISPs and their customers face the correct price signals to use the PSTN efficiently.

* * *

87. *Notice* ¶ 317.

I hereby swear, under penalty of perjury, that the foregoing is true and correct, to the best of my knowledge and belief.

J. Gregory Sidak

Subscribed and sworn to before me this 19 day of March, 1997.

Notary Public

My Commission expires: 4/30/99.

* * *

I hereby swear, under penalty of perjury, that the foregoing is true and correct, to the best of my knowledge and belief.

Daniel F. Spulber

Subscribed and sworn to before me this 17th day of March, 1997.

Notary Public

My Commission expires: 8/26/99.

OFFICIAL SEAL
ANITA L ZIMMERMAN
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES:08/26/99

On the Adverse Effects of Continuing Temporary Cost Subsidies

To the Commercial Internet Service Industry

Austin Communications Education Services, Incorporated

Principal Investigator:
Robert F. Austin, Ph.D.

March 24, 1997

Executive Summary

As part of the original ENFIA agreement in 1978, the Federal Communications Commission established a temporary cost subsidy for the nascent Enhanced Service Provider Industry. Today the Commercial Internet Service Industry takes advantage of the subsidy. The form of this subsidy was a temporary exemption from paying for the full cost of connecting to the Public Switched Telephone Network. During the subsequent years, the Commercial Internet Service Industry flourished and became a profitable, burgeoning sector of the economy.

The United States Telephone Association retained Austin Communications Education Services, Incorporated to evaluate the effects of this cost subsidy on the Commercial Internet Service Industry and on the Public Switched Telephone Network. This work was performed in conjunction with on-going public debate of Federal Communications Commission CC Docket No. 96-488.[1] Common Carrier Bureau Docket No. 96-488 encompasses discussion of four other dockets, including "Usage of the Public Switched Network by Information Service and Internet Access Providers" (CC Docket No. 96-263), with which this report is concerned.

The report considers the nature and extent of the problems caused by the subsidy. We also examine some of the more egregious examples of uninformed comment on this issue. The report concludes with an introduction to the technical options for maintaining the integrity of the Public Switched Telephone Network and a discussion of commercial alternatives for funding these technical options.

[1] Federal Communications Commission, "Notice of Proposed Rulemaking, Third Report and Order, and Notice of Inquiry CC Docket No. 96-488," Adopted: December 23, 1996, especially Section X, paragraphs 311-318, pages 137-140.

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On the Adverse Effects of Continuing Temporary Cost Subsidies To the Commercial Internet Service Industry

Austin Communications Education Services, Incorporated

Principal Investigator:
Robert F. Austin, Ph.D.

Introduction

Background

The Internet grew from multiple research projects on packet switching and communications conducted during the 1960s. The best known of these experiments was the Department of Defense Advanced Research Project Agency's ARPANET. During the 1970s, this network grew to encompass numerous other government agencies and academic institutions.

In 1983, the term "Internet" was used for the first time to describe the concept of interconnecting these disparate networks and connections. In 1985, these networks actually were united in a 56 kbps network, largely in response to a desire on the part of the National Science Foundation ("NSF") to link several NSF-funded university supercomputer centers and make these publicly-funded resources available to users at other locations.

Several universities actually did link to the NSF network to access the supercomputers. However, they and other users quickly found that the network was useful for other things such as electronic mail and the exchange of information between scientists. Consequently, traffic on the network increased dramatically. "In November, 1987, the

National Science Foundation awarded a contract to Merit Network, Inc. in partnership with IBM, MCI and the State of Michigan, to upgrade and operate the NSFNet backbone using 1.544 Mbps T-1 leased lines connecting six regional networks.[2]

The growth in the number of users was dramatic. The new network was turned up on July 1, 1988 with 170 local area networks connected and three weeks later the old 56 kbps network was turned off. Just six months after the T-1 network was born, the designers of the backbone began plans for a higher speed (45 Mpbs) T-3 backbone network.

> There was a great deal of discussion regarding the commercialization and privatization of the NSFNet backbone. The issues centered around whether the government should fund and operate a communications structure that competed with private companies such as MCI, AT&T, Sprint, and others - particularly when a growing amount of NSFNet traffic was becoming largely commercial in nature. To address this issue, a number of private commercial backbone operators joined to establish a separate point for the exchange of Internet traffic. The Commercial Internet Exchange ["CIX"] was formed and a router was set up in the WilTel equipment room in Santa Clara California. In theory, the private companies were "connected" through this CIX router.[3]

In 1993, the National Science Foundation announced that they would be leaving the backbone telecommunication business. The NSF designated several Network Access Points ("NAP") analogous to the CIX access point. They proposed to interconnect these points through the services of commercial carriers and other backbone operators. "In February 1994, NSF announced that four NAPs would be built. ... On April 30, 1995, the NSFNet backbone was essentially shut down, and the NAP architecture became the Internet."[4]

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[2] Rickard, Jack, "Internet Architecture," in *Internet Service Providers Directory*, Littleton, CO: Boardwatch Magazine, 1996. URL: http://www.boardwatch.com.isp.fallisp.archi.htm.
[3] Rickard, Jack, "Internet Architecture."
[4] Rickard, Jack, "Internet Architecture."

The Commercial Internet Service Industry

Discussion of the commercialization and privatization of the Internet was not limited to its principal sponsors. The use of an inter-network for interstate communications clearly made this new medium an appropriate subject for discussion within the Federal Communications Commission. As it evolved, the Internet clearly departed from its origins in the military and grew to become a knowledge tool of major importance in the public sector and the academic community. The FCC recognized the next stage in the development of this communications medium would be commercial in nature.

In 1978 and again in 1983 and 1987, the Federal Communications Commission ("FCC") effectively approved a temporary cost subsidy for the Enhanced Service Provider Industry, among other parties. One principal justification for this temporary subsidy was to encourage entrepreneurs and corporations to develop commercial applications to extend enhanced services to the general public. (It undoubtedly also was hoped in some areas of government that this might ultimately render the Internet financially self-supporting.)

The ENFIA Agreement, and the associated temporary subsidies, was scheduled to expire after five years or when the FCC reached a final decision on access charges whichever came first. Most of the terms of the Agreement ended in May 1985 as a result of subsequent decisions, while the subsidy for the Commercial Internet Service Industry has continued.

Summary of the Issue

It is clear that the subsidy was intended to be temporary. For many years, the subsidy was justified by concerns about the youth of the Commercial Internet Service Industry. These concerns are no longer valid. The Commercial Internet Service Industry is flourishing and profitable, as is demonstrated by statistics generated within the industry

itself.

However, this very flourishing has created a new set of problems, few of which were foreseen in the early FCC inquiries. Some of these problems are philosophical, others are technical and still others are financial. We consider these in turn, before concluding with a discussion of an appropriate set of solutions.

Maturity of the Commercial Internet Service Industry

Burgeoning ISP Industry

The growth of the Commercial Internet Service Industry can be measured in many ways. We previously considered one implicit measure of growth when we discussed the evolution of the network: the increase in transmission rates demanded and provided on the backbone of the network.

The Institute of Electrical and Electronics Engineers recently reported in their journal *The Institute* that "The Internet has been a rousing success at advancing electronic communications but things are getting a little too crowded for academics who need room, electronic room, to think."[5] Along similar lines, the editors of *Rural Telecommunications*, a journal of the National Telephone Cooperative Association, observed:

> The public acceptance, use and exponential growth of the Internet have even driven its originators – colleges and research centers – back to their drawing boards for solutions to the clogged communications arteries. In fact, a group of more than 30 academic centers recently announced plans to spin off its own alternative network [already dubbed "Internet II"] to avoid delays they've encountered in exchanging information.[6]

Named Internet II in the popular press, this next-generation Internet will feature even wider bandwidth in an effort to support the computational needs of the nation's scientific community.

Commenting on increasing bandwidth demand and offering, Rickard observed:

> The transit backbone bandwidth has essentially outgrown the ability of

[5] Gillespie, Greg, "When it comes to Internets, one just isn't enough," *The Institute*, February 1997, front page.
[6] Editors, "Traffic Jam on the Internet," *Rural Telecommunications*, January/February, 1997, page 9.

> routers to route and in some ways for ATM ["Asynchronous Transfer Mode"] switches to switch. But considering that the entire Internet was focused on a single 45 Mbps NSF backbone until April of 1995, and that less than a year and a half later we are seeing 13 backbones in operation with similar capacity, with at least four others in the wings still building - just not quite ready for this issue, it would appear that backbone capacity is growing at a FASTER rate than the growth of the Internet user base as a whole. With the addition of higher-bandwidth applications such as audio and video over the network, it undoubtedly needs to.[7]

Clearly, the providers of this bandwidth understand the commercial viability of the Internet industry. Indeed, so too must the bankers who provide financing for the enormous investment required for developing and offering this bandwidth. However, there are still some people who might suggest that this is not sufficiently hard evidence of the stability now exhibited by the Internet industry.

Fortunately for our purposes, there are even more specific and detailed measures of the growth of the Commercial Internet Service Industry. One major, respected source of information about the Commercial Internet Service Industry is *Boardwatch Magazine*.[8] The publishers of this periodical also publish the *Internet Service Providers Directory*, a compendium of information about the industry that appears quarterly in both digital and hard copy formats.

Even this quarterly publication frequency may be inadequate to fully describe the growth of the industry, however, as noted by the publisher:

> There are two or three provisos to keep in mind in reviewing those results. First, it represents a snapshot in time. The Internet is in a raging period of buildout. Essentially EVERYBODY is adding connections, ports, customers, and services at an incredible rate. Whatever they told us prior

[7] Rickard, Jack, "Introduction to the Directory of Internet Service Providers," in *Internet Service Providers Directory*, Littleton, CO: Boardwatch Magazine, 1996. URL: http:www.boardwatch.com.isp.fallisp.intro1.htm.

[8] Boardwatch Magazine, 8500 West Bowles Avenue, Suite 210, Littleton, CO 80123, Voice: (800) 933-6038; Voice: (303) 973-6038; Facsimile: (303) 973-3731.

to publication is almost assuredly changed by the time you read this.[9]

Unfortunately, therefore, the information presented in this report will understate virtually every aspect of growth of the Commercial Internet Service Industry. Nevertheless, it will serve to demonstrate the magnitude of the impact on the PSTN.

GENERAL OBSERVATIONS ON GROWTH

The *Internet Service Providers Directory* provided the following general observations about the industry. (NOTE: The publishers controlled for the effects of ISP size by excluding the top 10% and bottom 10% of all ISPs. This control excluded "the national backbone providers, large commercial services, and telephone companies, as well as a significant layer of truly one-man operations at the bottom."[10])

As of late 1996, the average ISP:

- had been in business for 22.2 months
- employed 12.98 people
- received a gross annual income of $637,571.76 or $49,119.55 per employee
- made an average annual investment in hardware of $125,698
- made an average annual investment in software of $39,917

The average ISP providing dial-up services

- served 1843.53 dial-up customers
- using 198.95 dial-up ports
- for an average of 9.26 dial-up customers per modem. (The publishers stated that for companies that reported both the number of dial-up customers and the number of dial-up ports, the average was 8.47 customers per modem.)

Finally, the publishers observed:

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[9] Rickard, Jack, "Introduction to the Directory of Internet Service Providers."
[10] Rickard, Jack, "Introduction to the Directory of Internet Service Providers."

> If we INCLUDE the top and bottom 10%, the average number of dial-up customers was more like 2272.6 among 2568 providers answering the question for 5,836,037 users. Applying the average to all 3068 ISPs we list would render 6,972,337 dial-up users served by this group. We know from several outside surveys that almost exactly 60% of those on the Internet are there via a dial-up connection. This would indicate a core group of 11,620,561 including dedicated access people that are pretty seriously using the Internet in North America.[11]

INCREASE IN HOSTS AND DOMAINS

Another measure of the Internet's growth is the increase in the number of host computers attached to the network and the number of assigned domains (or "addresses"). As we can see in the following table, this growth has been exponential in nature for the past four years.

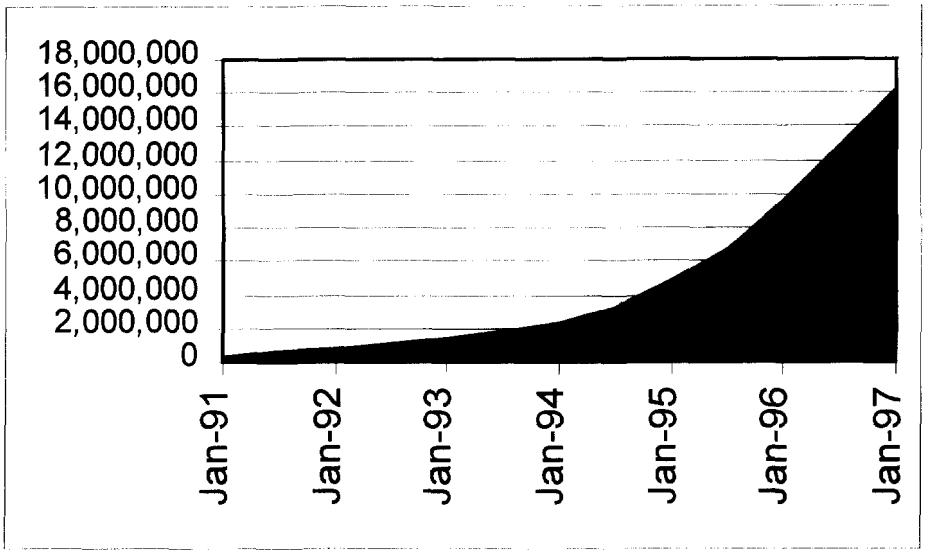
Table: Growth of Internet Addresses[12]

January	Hosts	Domains
1993	1,300,000	21,000
1994	2,200,000	30,000
1995	4,900,000	71,000
1996	9,500,000	240,000

[NOTE: Hosts are machine addresses. "Fcc.gov," "mit.edu" and "internet.net" are examples of domains.]

[11] Rickard, Jack, "Introduction to the Directory of Internet Service Providers."
[12] Gray, Matthew, 1996, "Internet Growth Summary," http://www.mit.edu/people/mkgray/net/.

Graphically, we can see this growth trend as shown here.[13]



The World Wide Web (often referred to as "the Web") as been a particularly visible sector of the Internet. Growth in the Web has been equally impressive.

Table: Web Growth Summary[14]

Date	Number of Web sites
June, 1993	130
December, 1993	623
June, 1994	2,738
December, 1994	10,022
June, 1995	23,500
January, 1996	100,000
June, 1996	(estimated) 230,000

[13] Internet Domain Survey http://www.genmagic.com/Internet/Trends/sid004.gif.
[14] Gray, Matthew, 1996, "Web Growth Summary," http://www.mit.edu/people/mkgray/net/web-growth-summary.html.